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# A Hybrid Fuzzy Logic And Extreme Learning Machine For

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Advances in Fuzzy Logic and Technology 2017

IJCAI '95 Workshop, Montreal, Canada, August 19-21, 1995, Selected Papers

Fuzzy Logic, Neural Networks, and Genetic Algorithms

9th International Workshop, WILF 2011, Trani, Italy, August 29-31, 2011, Proceedings

NEURAL NETWORKS, FUZZY LOGIC AND GENETIC ALGORITHM

Fuzzy Logic in Geology

Proceedings of: EUSFLAT-2017 - The 10th Conference of the European Society for Fuzzy Logic and Technology, September 11-15,

2017, Warsaw, Poland IWIFSGN'2017 - The Sixteenth International Workshop on Intuitionistic Fuzzy Sets and Generalized Nets,

September 13-15, 2017, Warsaw, Poland, Volume 1

Development of a Real Time Adaptive Controller Utilizing Hybrid Fuzzy Logic/crisp Expert Rules and Neural Network Based Inferential Sensing for Constrained Optimization of an Elemental Phosphorus Calcining Furnace

Hybrid Fuzzy Logic Control to Stabilize an Inverted Pendulum from Arbitrary Initial Conditions

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A Hybrid Algorithm and Its Applications to Fuzzy Logic Modeling of Nonlinear Systems

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Recent Advances of Hybrid Intelligent Systems Based on Soft Computing

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2019 19th International Conference on Sciences and Techniques of Automatic Control and Computer Engineering (STA)

Fuzzy Logic and Applications

An Essential Guide to Fuzzy Systems

Fuzzy Logic for Embedded Systems Applications

12th International Workshop, WILF 2018, Genoa, Italy, September 6-7, 2018, Revised Selected Papers

Fuzzy Logic in Action: Applications in Epidemiology and Beyond

Fuzzy Logic Hybrid Extensions of Neural and Optimization Algorithms: Theory and Applications

Soft Computing for Hybrid Intelligent Systems

Applying Fuzzy Logic for the Digital Economy and Society

Intelligent Hybrid Systems

*A Hybrid Fuzzy Logic And Extreme Learning Machine For*

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*Advances in Fuzzy Logic and Technology 2017* Springer Science & Business Media

While several books are available today that address the mathematical and philosophical foundations of fuzzy logic, none, unfortunately, provides the practicing knowledge engineer, system analyst, and project manager with specific, practical information about fuzzy system modeling. Those few books that include applications and case studies concentrate almost exclusively on engineering problems: pendulum balancing, truck backeruppers, cement kilns, antilock braking systems, image pattern recognition, and digital signal processing. Yet the application of fuzzy logic to engineering problems represents only a fraction of its real potential. As a method of encoding and using human knowledge in a form that is very close to the way experts think about difficult, complex problems, fuzzy systems provide the facilities necessary to break through the computational

bottlenecks associated with traditional decision support and expert systems. Additionally, fuzzy systems provide a rich and robust method of building systems that include multiple conflicting, cooperating, and collaborating experts (a capability that generally eludes not only symbolic expert system users but analysts who have turned to such related technologies as neural networks and genetic algorithms). Yet the application of fuzzy logic in the areas of decision support, medical systems, database analysis and mining has been largely ignored by both the commercial vendors of decision support products and the knowledge engineers who use them.

*IJCAI '95 Workshop, Montreal, Canada, August 19-21, 1995, Selected Papers* IntechOpen

What is fuzzy logic?--a system of concepts and methods for exploring modes of reasoning that are approximate rather than exact. While the engineering community has appreciated the advances in understanding using fuzzy logic for quite some time, fuzzy logic's impact in non-engineering disciplines is only now being recognized. The authors of *Fuzzy Logic in Geology* attend to this growing interest in the subject and introduce the use of

fuzzy set theory in a style geoscientists can understand. This is followed by individual chapters on topics relevant to earth scientists: sediment modeling, fracture detection, reservoir characterization, clustering in geophysical data analysis, ground water movement, and time series analysis. George Klir is the Distinguished Professor of Systems Science and Director of the Center for Intelligent Systems, Fellow of the IEEE and IFSA, editor of nine volumes, editorial board member of 18 journals, and author or co-author of 16 books. Foreword by the inventor of fuzzy logic-- Professor Lotfi Zadeh

Fuzzy Logic, Neural Networks, and Genetic Algorithms Springer

This edited book presents the state-of-the-art of applying fuzzy logic to managerial decision-making processes in areas such as fuzzy-based portfolio management, recommender systems, performance assessment and risk analysis, among others. Presenting the latest research, with a strong focus on applications and case studies, it is a valuable resource for researchers, practitioners, project leaders and managers wanting to apply or improve their fuzzy-based skills.

**9th International Workshop, WILF 2011, Trani, Italy, August 29-31, 2011, Proceedings** World Scientific

This book reviews current state of the art methods for building intelligent systems using type-2 fuzzy logic and bio-inspired optimization techniques. Combining type-2 fuzzy logic with optimization algorithms, powerful hybrid intelligent systems have been built using the advantages that each technique offers. This book is intended to be a reference for scientists and engineers interested in applying type-2 fuzzy logic for solving problems in pattern recognition, intelligent control, intelligent manufacturing, robotics and automation. This book can also be used as a reference for graduate courses like the following: soft computing, intelligent pattern recognition, computer vision, applied artificial intelligence, and similar ones. We consider that this book can also be used to get novel ideas for new lines of re-search, or to continue the lines of research proposed by the authors.

NEURAL NETWORKS, FUZZY LOGIC AND GENETIC ALGORITHM Springer Science & Business Media

This book describes new methods for building intelligent systems using type-2 fuzzy logic and soft computing (SC) techniques. The authors extend the use of fuzzy logic to a higher order, which is called type-2 fuzzy logic. Combining type-2 fuzzy logic with traditional SC techniques, we can build powerful hybrid intelligent systems that can use the advantages that each technique offers. This book is intended to be a major reference tool and can be used as a textbook.

**Fuzzy Logic in Geology** LAP Lambert Academic Publishing

This thoroughly refereed and well organized collection of papers is largely based on papers originally presented at the IJCAI'95 Workshop on Fuzzy Logic in AI, held in Montreal, Canada, in August 1995. Additionally, a few papers were invited in order to round off the scope and competent coverage of relevant topics. The 20 revised full papers included are organized in sections on hybrid and novel architectures, machine learning and data mining, image processing and computer vision, and theoretical developments. Focusing on the most pressing problems of AI, the volume supports the view that fuzzy systems combined with traditional AI leads the move towards the next generation of intelligent systems.

Proceedings of: EUSFLAT-2017 - The 10th Conference of the European Society for Fuzzy Logic and Technology, September 11-15, 2017, Warsaw, Poland  
IWIFSGN'2017 - The Sixteenth International Workshop on Intuitionistic Fuzzy Sets and Generalized Nets, September 13-15, 2017, Warsaw, Poland, Volume 1 Springer Science & Business Media

This volume includes most of the recent results obtained by

Italian researchers in fuzzy logic. It collects selected papers from the 1997 Italian Workshop on Fuzzy Logic — WILF '97 and some invited papers, covering the mathematical foundations of fuzzy logic, neuro-fuzzy systems, hardware implementation of fuzzy logic controllers, and gives an update on applications to control, physics, decision support systems and pattern analysis.

*Development of a Real Time Adaptive Controller Utilizing Hybrid Fuzzy Logic/crisp Expert Rules and Neural Network Based Inferential Sensing for Constrained Optimization of an Elemental Phosphorus Calcining Furnace* Physica

The 1960s were perhaps a decade of confusion, when scientists faced difficulties in dealing with imprecise information and complex dynamics. A new set theory and then an infinite-valued logic of Lotfi A. Zadeh were so convincing that they were called fuzzy set theory and fuzzy logic; a deterministic system found by E. N. Lorenz to have random behaviours was so unusual that it was lately named a chaotic system. Just like irrational and imaginary numbers, negative energy, anti-matter, etc., fuzzy logic and chaos were gradually and eventually accepted by many, if not all, scientists and engineers as fundamental concepts, theories, as well as technologies. In particular, fuzzy systems technology has achieved its maturity with widespread applications in many industrial, commercial, and technical fields, ranging from control, automation, and artificial intelligence to image/signal

processing, pattern recognition, and electronic commerce. Chaos, on the other

hand, was considered one of the three monumental discoveries of the twentieth century together with the theory of relativity and quantum mechanics. As a very special nonlinear dynamical phenomenon, chaos has reached its current outstanding status from being merely a scientific curiosity in the mid-1960s to an applicable technology in the late 1990s. Finding the intrinsic relation between fuzzy logic and chaos theory is certainly of significant interest and of potential importance. The past 20 years have indeed witnessed some serious explorations of the interactions between

fuzzy logic and chaos theory, leading to such research topics as fuzzy modeling of chaotic systems using Takagi-Sugeno models, linguistic descriptions of chaotic systems, fuzzy control of chaos, and a combination of fuzzy control technology and chaos theory for various engineering practices.

*Hybrid Fuzzy Logic Control to Stabilize an Inverted Pendulum from Arbitrary Initial Conditions* Springer Science & Business Media

The recent development of the fuzzy set theory has given scientists the opportunity to model under conditions which are vague or not precisely defined, thus succeeding to solve mathematically problems whose statements are expressed in our natural language. Since Zadeh introduced the concept of fuzzy set in 1965, many efforts have been made by specialists for improving its effectiveness to deal with uncertain, ambiguous and vague situations. As a result a series of extensions and generalizations of the ordinary fuzzy set followed and several theories have been proposed as alternatives to the fuzzy set theory. The spectre of applications of those theories has been rapidly expanded during the last years covering physical sciences, economics and management, expert systems like financial planners, diagnostic, meteorological, information-retrieval, control systems, etc, industry, robotics, decision making, programming, medicine, biology, humanities, education and almost all the other sectors of the human activity, including human reasoning itself. The target of the present book is to become an essential guide to fuzzy sets and systems and to related theories. The whole book consists of ten chapters and a

shorter commentary. It starts from the history and an introduction to fuzzy sets and logic and from a brief exposition of related theories. The management of the uncertainty in fuzzy environment as well as the evaluation of fuzzy data, frequently appearing nowadays in science and technology, are also studied. Assessment methods are presented using tools such as triangular fuzzy numbers, fuzzy relation equations and the grey system theory. An introduction to the theory of fuzzy graphs, a review of the hybrids of neural networks and fuzzy logic and an introduction to single valued neutrosophic numbers and the granular calculus of single valued neutrosophic functions are also contained among the topics of the book. More specialized topics include the controllability of non linear fuzzy fractional differential systems, the use of fuzzy probability and fuzzy possibility theory for integrating the voltage sag type detection of electrical networks, the presentation of an algorithm to highlight the importance of using statistical methods in pattern recognition, the study of the known from Physics Goursat problem for a fuzzy hyperbolic equation under the fractional Caputo  $g$ -derivative for fuzzy-valued multivariable functions and a hybrid fuzzy potential field method for the navigation of Sumo robots. It is hoped that all the above information can provide a framework to the readers of the book that enable them to proceed to a deeper study of fuzzy systems and the related to them theories.

#### **A Hybrid Approach Based on Fuzzy Logic, Neural Networks and Genetic Algorithms** Design of Hybrid Fuzzy Logic Controllers

Ever since fuzzy logic was introduced by Lotfi Zadeh in the mid-sixties and genetic algorithms by John Holland in the early seventies, these two fields widely been subjects of academic research the world over. During the last few years, they have been experiencing extremely rapid growth in the industrial world, where they have been shown to be very effective in solving real-world problems. These two substantial fields, together with neurocomputing techniques, are recognized as major parts of soft computing: a set of computing technologies already riding the waves of the next century to produce the human-centered intelligent systems of tomorrow; the collection of papers presented in this book shows the way. The book also contains an extensive bibliography on fuzzy logic and genetic algorithms. *The Fuzzy Hybrid Decision Support System Using Neural Networks, Fuzzy Logic Controllers, and Object Oriented Databases* Springer

This volume constitutes the proceedings of two collocated international conferences: EUSFLAT-2017 – the 10th edition of the flagship Conference of the European Society for Fuzzy Logic and Technology held in Warsaw, Poland, on September 11–15, 2017, and IWIFSGN'2017 – The Sixteenth International Workshop on Intuitionistic Fuzzy Sets and Generalized Nets, held in Warsaw on September 13–15, 2017. The conferences were organized by the Systems Research Institute, Polish Academy of Sciences, Department IV of Engineering Sciences, Polish Academy of Sciences, and the Polish Operational and Systems Research Society in collaboration with the European Society for Fuzzy Logic and Technology (EUSFLAT), the Bulgarian Academy of Sciences and various European universities. The aim of the EUSFLAT-2017 was to bring together theoreticians and practitioners working on fuzzy logic, fuzzy systems, soft computing and related areas and to provide a platform for exchanging ideas and discussing the latest trends and ideas, while the aim of IWIFSGN'2017 was to discuss new developments in extensions of the concept of a fuzzy set, such as an intuitionistic fuzzy set, as well as other concepts, like that of a generalized net. The papers included, written by leading international experts, as well as the special sessions and panel discussions contribute to the development the field,

strengthen collaborations and intensify networking.

#### Fuzzy Systems Springer

A number of academic and industrial researches in control systems have exposed the inherent weaknesses of PID control which are; rigidity, prohibitive computational complexity and non-applicability for intelligent and complex systems. Consequently, a group of researchers have proposed fuzzy logic control as a better alternative to PID control. This notion has spawned numerous debates among researchers, experts and professionals in the field of control systems. As a result, this book investigates and compares the performance of traditional control techniques with fuzzy logic control which will be optimized and made adaptive to the variations of the sensor input. It will also be proven that fuzzy logic control is far more superior in performance to the existing traditional control techniques. These objectives were achieved through the use of MATLAB and SIMULINK to simulate, tweak and fine-tune the different cases for the response and their respective performance metrics. Interestingly as expected, the results of the simulations show that fuzzy logic control, optimized or not, is better than the traditional control techniques, especially, PID control

#### **Fuzzy Logic in Artificial Intelligence** World Scientific

We describe in this book, new methods and applications of hybrid intelligent systems using soft computing techniques. Soft Computing (SC) consists of several intelligent computing paradigms, including fuzzy logic, neural networks, and evolutionary algorithms, which can be used to produce powerful hybrid intelligent systems. The book is organized in five main parts, which contain a group of papers around a similar subject. The first part consists of papers with the main theme of intelligent control, which are basically papers that use hybrid systems to solve particular problems of control. The second part contains papers with the main theme of pattern recognition, which are basically papers using soft computing techniques for achieving pattern recognition in different applications. The third part contains papers with the themes of intelligent agents and social systems, which are papers that apply the ideas of agents and social behavior to solve real-world problems. The fourth part contains papers that deal with the hardware implementation of intelligent systems for solving particular problems. The fifth part contains papers that deal with modeling, simulation and optimization for real-world applications.

#### *A Hybrid Mixture of Neural Networks, Fuzzy Logic and Expert Systems for the Generation of Trading Signals in a Financial Market* PHI Learning Pvt. Ltd.

Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms is an organized edited collection of contributed chapters covering basic principles, methodologies, and applications of fuzzy systems, neural networks and genetic algorithms. All chapters are original contributions by leading researchers written exclusively for this volume. This book reviews important concepts and models, and focuses on specific methodologies common to fuzzy systems, neural networks and evolutionary computation. The emphasis is on development of cooperative models of hybrid systems. Included are applications related to intelligent data analysis, process analysis, intelligent adaptive information systems, systems identification, nonlinear systems, power and water system design, and many others. Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms provides researchers and engineers with up-to-date coverage of new results, methodologies and applications for building intelligent systems capable of solving large-scale problems.

#### Integration of Fuzzy Logic and Chaos Theory Physica

We describe in this book, recent developments on fuzzy logic,

neural networks and optimization algorithms, as well as their hybrid combinations, and their application in areas such as, intelligent control and robotics, pattern recognition, medical diagnosis, time series prediction and optimization of complex problems. The book contains a collection of papers focused on hybrid intelligent systems based on soft computing. There are some papers with the main theme of type-1 and type-2 fuzzy logic, which basically consists of papers that propose new concepts and algorithms based on type-1 and type-2 fuzzy logic and their applications. There also some papers that presents theory and practice of meta-heuristics in different areas of application. Another group of papers describe diverse applications of fuzzy logic, neural networks and hybrid intelligent systems in medical applications. There are also some papers that present theory and practice of neural networks in different areas of application. In addition, there are papers that present theory and practice of optimization and evolutionary algorithms in different areas of application. Finally, there are some papers describing applications of fuzzy logic, neural networks and meta-heuristics in pattern recognition problems.

#### Type-2 Fuzzy Logic: Theory and Applications Springer

The primary purpose of this book is to present information about selected topics on the interactions and applications of fuzzy + neural. Most of the discussion centers around our own research in these areas. Fuzzy + neural can mean many things: (1) approximations between fuzzy systems and neural nets (Chapter 4); (2) building hybrid neural nets to equal fuzzy systems (Chapter 5); (3) using neural nets to solve fuzzy problems (Chapter 6); (4) approximations between fuzzy neural nets and other fuzzy systems (Chapter 8); (5) constructing hybrid fuzzy neural nets for certain fuzzy systems (Chapters 9, 10); or (6) computing with words (Chapter 11). This book is not intend to be used primarily as a text book for a course in fuzzy + neural because we have not included problems at the end of each chapter, we have omitted most proofs (given in the references), and we have given very few references. We wanted to keep the mathematical prerequisites to a minimum so all longer, involved, proofs were omitted. Elementary differential calculus is the only prerequisite needed since we do mention partial derivatives once or twice.

#### *Stability of a Fuzzy Logic Based Piecewise Linear Hybrid System* Springer Nature

This book provides comprehensive introduction to a consortium of technologies underlying soft computing, an evolving branch of computational intelligence. The constituent technologies discussed comprise neural networks, fuzzy logic, genetic algorithms, and a number of hybrid systems which include classes such as neuro-fuzzy, fuzzy-genetic, and neuro-genetic systems. The hybridization of the technologies is demonstrated on architectures such as Fuzzy-Back-propagation Networks (NN-FL), Simplified Fuzzy ARTMAP (NN-FL), and Fuzzy Associative Memories. The book also gives an exhaustive discussion of FL-GA hybridization. Every architecture has been discussed in detail through illustrative examples and applications. The algorithms have been presented in pseudo-code with a step-by-step illustration of the same in problems. The applications, demonstrative of the potential of the architectures, have been chosen from diverse disciplines of science and engineering. This

book with a wealth of information that is clearly presented and illustrated by many examples and applications is designed for use as a text for courses in soft computing at both the senior undergraduate and first-year post-graduate engineering levels. It should also be of interest to researchers and technologists desirous of applying soft computing technologies to their respective fields of work.

#### *Fuzzy Logic and Applications* Springer Science & Business Media

This book constitutes the post-conference proceedings of the 12th International Workshop on Fuzzy Logic and Applications, WILF 2018, held in Genoa, Italy, in September 2018. The 17 revised full papers and 9 short papers were carefully reviewed and selected from 26 submissions. The papers are organized in topical sections on fuzzy logic theory, recent applications of fuzzy logic, and fuzzy decision making. Also included are papers from the round table "Zadeh and the future of logic" and a tutorial.

#### *New Trends In Fuzzy Logic II - Proceedings Of The Wilf '97 - Second Italian Workshop On Fuzzy Logic 1997* Springer Science & Business Media

This book constitutes the refereed proceedings of the 9th International Workshop on Fuzzy Logic and Applications, WILF 2011 held in Trani, Italy in August 2011. The 34 revised full papers presented were carefully reviewed and selected from 50 submissions. The papers are organized in topical sections on advances in theory of fuzzy sets, advances in fuzzy systems, advances in classification and clustering; and applications.

#### *The Application of Fuzzy Logic for Managerial Decision Making Processes* IGI Global

Fuzzy Logic in Action: Applications in Epidemiology and Beyond, co-authored by Eduardo Massad, Neli Ortega, Laécio Barros, and Cláudio Struchiner is a remarkable achievement. The book brings a major paradigm shift to medical sciences exploring the use of fuzzy sets in epidemiology and medical diagnosis arena. The volume addresses the most significant topics in the broad areas of epidemiology, mathematical modeling and uncertainty, embodying them within the framework of fuzzy set and dynamic systems theory. Written by leading contributors to the area of epidemiology, medical informatics and mathematics, the book combines a very lucid and authoritative exposition of the fundamentals of fuzzy sets with an insightful use of the fundamentals in the area of epidemiology and diagnosis. The content is clearly illustrated by numerous illustrative examples and several real world applications. Based on their profound knowledge of epidemiology and mathematical modeling, and on their keen understanding of the role played by uncertainty and fuzzy sets, the authors provide insights into the connections between biological phenomena and dynamic systems as a mean to predict, diagnose, and prescribe actions. An example is the use of Bellman-Zadeh fuzzy decision making approach to develop a vaccination strategy to manage measles epidemics in São Paulo. The book offers a comprehensive, systematic, fully updated and self-contained treatise of fuzzy sets in epidemiology and diagnosis. Its content covers material of vital interest to students, researchers and practitioners and is suitable both as a textbook and as a reference. The authors present new results of their own in most of the chapters. In doing so, they reflect the trend to view fuzzy sets, probability theory and statistics as an association of complementary and synergetic modeling methodologies.